

**Vertical Foreclosure in the U.S. Cable Television Market: An Empirical Study of
Program Network Carriage and Positioning**

Dong Chen
School of Economics
Peking University
Beijing, China 100871
dongchen76@hotmail.com

David Waterman
Department of Telecommunications
Indiana University
1229 E. 7th St.
Bloomington, IN 47405
waterman@indiana.edu

August 7, 2005

We thank the Kelly School of Business and the Department of Telecommunications at Indiana University, Bloomington, for their support of this study.

Abstract

We provide recent empirical evidence of vertical foreclosure in the U.S. cable television market, primarily using a 2004 database of 680 cable systems. Focusing on behavior of Comcast and Time Warner systems with respect to four program network groups (basic outdoor entertainment, basic cartoon, basic movie, and premium movie), we find that more frequent carriage of affiliated networks and less frequent carriage of rival networks (a pattern identified by previous empirical studies) persists in spite of extensive channel capacity expansion and digitization of cable systems, as well as new competition from DBS. We also find that integrated cable operators that do carry rival networks are more likely to position them on digital tiers, or in other ways that appear to limit demand for them, a phenomenon unexplored by previous authors. Overall, vertical foreclosure remains a significant phenomenon in the U.S. cable television market.

1 Introduction

We define “vertical foreclosure” to mean that a vertically integrated firm with monopoly power in a downstream market limits or denies access of its rivals’ inputs to that market. The cable television industry provides an opportunity to study vertical foreclosure empirically. First, apparently due to the large fixed cost associated with laying physical cable networks, cable system operators are typically local monopolists in a given geographic area, creating a bottleneck that gives rise to the potential threat of foreclosure.¹ Second, as of 2003, 33% of the 339 national cable programming networks that serve as potential inputs to those systems were vertically affiliated with one or more multiple system operators (MSOs).² One major MSO, Time Warner, had ownership interest in 62 national programming networks, including CNN, Home Box Office (HBO) and Cartoon Network. Comcast, the largest MSO with 22.7% of the national market in 2003, had ownership interest in 41 programming networks, including Outdoor Life Network and E! Entertainment.³ These equity-based vertical affiliations may affect the cable operators’ decisions on product choice, pricing, and other marketing behaviors. Third, the national cable TV market is divided into over 11,000 franchise areas; available information about the individual cable systems in each area constitutes a rich dataset to explore the effect of vertical integration on market outcomes.

As we detail further, previous empirical studies of the effects of vertical integration in cable television have established vertical foreclosure as we define it to exist, both for certain premium and for certain basic networks (Waterman & Weiss, 1996, 1997; Chipty, 2001). In particular, those studies found that integrated cable operators have tended to carry their affiliated networks relatively more frequently, and rival networks less frequently, and that the total number of cable networks varies with ownership. Those studies, however, relied on data from the late 1980s or early 1990s,

¹ Before 1992, incumbent cable operators were typically awarded monopoly status by the local governments through exclusive franchises. The 1992 Cable Television Consumer Protection and Competition Act removed such restrictions and allowed potential entry. However, as of 2003, new entrants to the cable programming distribution business (called “overbuilds”) are present in only 2.6% of US cable franchise areas (Federal Communication Commission, 2004, paragraph 126).

² Federal Communication Commission (2004), paragraph 141.

³ These numbers were obtained by counting iN Demand’s 35 multiplexed channels separately. Federal Communication Commission (2004), paragraph 143.

before competition from DBS and massive expansions of cable system channel capacity due to digital technology--forces that might be expected to alleviate foreclosure. Also, the extent to which earlier studies were able to measure “discriminatory” marketing practices affecting the integrated and non-integrated networks that a system does choose to carry was very limited.

In this paper, we examine the existence and the extent of vertical foreclosure in the U. S. cable television industry, using cross-sectional data involving 680 cable systems in the early to mid-2000s, focusing on four distinct groups of closely substitutable cable networks. In brief summary, we find that foreclosure in cable television is a persistent phenomenon in the U.S. cable television industry, as indicated both by rates of network carriage, and by the positioning of networks on analog vs. digital program tiers.

In the next section, we discuss foreclosure, summarize previous literature on this topic, and elaborate motivation for the present study. In Section III and IV, we describe our empirical method and discuss our hypotheses. Section V contains a description of the data and some descriptive statistics. The empirical models and the estimation results concerning cable operators’ program carriage and position patterns are presented in Section VI, followed by concluding remarks in Section VII.

II Background and Previous Studies

The cable television industry can be divided into three successive stages: program producers, program service providers (or “networks”), and cable operators. The producers create the video programming products and sell them to the networks, who act in turn as wholesalers in this industry. (Production and networking are heavily integrated.) Networks arrange, package, and market the programs and offer them to cable operators, who act as retailers by signing up subscribers. Subscribers purchase programming as parts of various packages (eg, “basic” or “expanded basic” service, or various digital tiers), or a la carte, by buying individual subscription networks or pay-per-view programs.

As noted above, vertical affiliations via equity ownership between cable

operators and cable networks are significant. Most local cable systems are organized into MSOs, which engage in master affiliation agreements with cable network providers. Among other terms, those contracts typically specify per-subscriber fees to be paid to the networks carried by the MSO's systems. In a number of cases, a certain network may be carried by all the systems of an MSO, but especially with less established networks, only some of the MSO's systems carry a given network.

In this market environment, vertical foreclosure might occur either for anti-competitive or for benign, efficiency-based reasons. An anti-competitive theory of foreclosure in cable television that has raised interest among economists and policy makers hinges on the fact that the distribution of video programming network inputs is characterized by significantly increasing returns to scale (Owen and Wildman, 1992). A large portion of the total cost of producing and distributing cable networks consists of the initial production cost, or the "first-copy" cost. In comparison, the cost of distributing this video programming via satellite is negligible. Therefore, the size of the national audience that a certain video program is able to reach (and thus can collect revenue from) is crucial to determining its average cost. This condition provides a potential incentive for a vertically integrated cable operator having a significant share of the national cable market to raise an upstream network rival's costs per subscriber by excluding that network from its program menu.

Furthermore, for an advertisement-supported basic cable network, cost-per-thousand ad rates are an increasing function of the network's national audience reach, apparently because advertisers regard geographic gaps in the national audience coverage of a given network to be a serious disadvantage (Waterman and Yan, 1999). In this case, foreclosure may not only increase average programming costs, but disproportionately reduce the network's advertising revenues. In turn, the rival network will be disadvantaged in its ability to offer a competitive quality of programming, and may be induced to exit the market altogether.

Of course, such foreclosure is not without short term costs. Excluding programming networks for strategic reasons necessarily means that the cable operator gives up potentially profitable retailing opportunities. Which effect actually dominates

in the integrated cable operator's decision making process remains an empirical question.

Vertical foreclosure in cable television does not necessarily imply an anti-competitive motive. If two programming networks are close substitutes, for example, then carrying one of them will necessarily reduce subscriber demand for the other. Cable operators face capacity constraints just as grocers face shelf space costs for carrying another cereal brand. If vertical integration of a cable operator with premium network *A* reduces its effective wholesale input price for efficiency reasons (due to elimination of double marginalization, for example), the operator has an incentive to reduce *A*'s subscription price, which in turn reduces demand for a rival premium network, *B*. The end result may be the exclusion of *B* from the operator's menu because demand becomes insufficient to cover marginal carriage costs.⁴ Cable operators always face more program carriage opportunities than they can accommodate, so it is inevitable that menus will be affected by vertical integration if that integration makes certain network effectively cheaper to carry.

However, even if foreclosure is benign in its intent, thus raising no antitrust concerns, its results may still be undesirable due to non-economic considerations. Exclusion of rival networks reduces the amount and the variety of information that is available to the public. Such a reduction in the diversity of opinions (eg, in the case of cable news networks) can in itself be a concern from a broader social point of view, as evidenced by a history of federal legislation, FCC rulings and other constraints on media firms.⁵

In either the anti-competitive or the efficiency foreclosure scenario, it is important to emphasize that damage to program diversity beyond the local level depends critically on the national market share of the foreclosing MSO. If that share is insufficiently large, the effects on rivals' cost will be insufficient for an anti-competitive foreclosure strategy to be viable--or in the efficiency motivation

⁴ Waterman and Weiss (1997) construct an example of this efficiency-based foreclosure process.

⁵ See in particular, "In the Matter of Time Warner, Inc., Turner Broadcasting Systems, Inc, Telecommunications, Inc, and Liberty Media Corporation, United States of America, Before the Federal Trade Commission, Agreement Containing Consent Order, File No. 961-0004 (September 12, 1996). The FTC Ruling required Time Warner to carry at least one basic cable news service in addition to CNN as a condition of the Time Warner-Turner merger.

case--for diversity to be effectively influenced at the national level.

Previous empirical studies of the cable television market have found evidence that is consistent with a theory of vertical foreclosure. Using 1989 data, Waterman and Weiss (1996) found that cable operators' likelihood of carrying the four main rival premium networks of the time (HBO, Cinemax, Showtime and The Movie Channel) was significantly higher than average if the operator was vertically affiliated with the network, and significantly lower if the network were an unaffiliated rival. The authors also found that given the decision to carry a rival network, integrated cable operators tended to favor their affiliated networks in pricing and marketing activities, as inferred by subscribership penetration rates. At the aggregate level, the authors found that operators integrated with some of the premium networks tended to carry significantly fewer premium networks in total. Waterman and Weiss (1997) supplemented this study with analysis showing that operators vertically affiliated with seven basic cable networks carried those networks more frequently than unaffiliated cable operators in nearly all cases.

Chitty (2001) conducted a similar study using 1991 data. At the individual network level, she found that cable operators vertically integrated with the TV shopping service, QVC, were less likely to carry the competing independent service, HSN. In addition, she reported that Time Warner and Viacom, both MSO owners of premium networks at the time, were less likely to carry the basic movie service, American Movie Classics (AMC). At the aggregate level, Chitty found that vertical integration with basic cable networks lead cable operators to offer a greater number of basic services, while integration with premium services resulted in fewer than average networks carried. While Waterman and Weiss did not distinguish between efficiency and anti-competitive strategic motives for carriage pattern differences, Chitty reported empirical evidence that consumer welfare increased as a result of the vertical integration. Another empirical study of the industry published by Ford and Jackson (1997) reported that vertical integration between cable operators and networks, as well as horizontal concentration of MSOs, lowered programming costs.

The results of these previous studies suggest that vertical foreclosure may be

present in the U.S. cable television industry, but they were based on data from more than a decade ago. In 1994 (three years after the period examined by the last major economic study), the average cable system was able to provide 37 analog video channels.⁶ By 2004, the average number of analog channels had increased to 70 and the average number of digital channels was about 120.⁷ Some of the capacity increase has followed from more efficient hardware such as fiber optic cables. The digital component of the increase has been largely due to the extensive diffusion of digital compression technology since the mid-1990s. That technology, in combination with various hardware components, generally allows 12 or more digital channels of comparable video quality to be offered in place of one analog channel. As a result, most operators now offer “digital tiers” of 30 to over 100 additional channels that include certain basic and premium subscription networks and pay-per-view or video-on-demand program channels. Prior to 1997, no cable operator in the U.S. offered digital video service, while as of June 2003, digital cable services were available to about 90% of all cable subscribers.⁸

Contemporaneous with these changes has been a large increase in the number of competing cable networks. According to the FCC, the number of cable networks in business increased from 106 in 1994 to 339 in 2003.⁹

With these great increases in channel capacity and network competition, it is interesting to examine whether the observed foreclosure patterns found in earlier studies still persist. First, a reduction of channel carriage opportunity costs is implied by the expansion of average system capacity. Secondly, increased audience fragmentation due to more competing networks implies that audience substitution effects, and thus the incentive of operators to exclude “rival” networks (for either efficiency or anticompetitive motives), should diminish.

Another change affecting the cable industry is the competition from direct

⁶ Authors’ calculation based on Table 3 in Federal Communication Commission (1994).

⁷ Federal Communication Commission (2004), paragraph 25.

⁸ Federal Communication Commission (2004), paragraph 41. Although digital services are widely available, only 31.26% of the basic cable subscribers, or about 20.6 million, actually subscribed to digital services as of June 2003.

⁹ Federal Communication Commission (2004), Table 8.

broadcast satellite (DBS), a nationally distributed multi-channel service offering a menu that includes most of the same basic and premium networks. Although relatively marginal “home satellite dish” (HSD) systems existed in 1990, its U.S. household penetration never exceeded about 3.5%.¹⁰ “True” DBS began with the 1994 launch of DirecTV. By 2003, DBS penetration reached 21.6%.¹¹ In general, competition should mitigate vertical foreclosure by increasing the marginal incentive of cable operators to offer a programming menu of maximum appeal to subscribers or by decreasing the marginal effectiveness of a strategic foreclosure strategy.¹²

Finally, the emergence of digital cable service introduces a more subtle issue in cable operators’ program carriage that has not been systematically studied in previous research. Besides the choice of whether to include a particular programming network on its menu, a cable operator decides whether to offer it on an analog or digital tier. Much like magazines, basic cable networks earn revenues from advertising (for the average basic network, about two thirds of its total revenue) and per-subscriber fees charged to cable operators. In general, these networks regard carriage on a basic analog tier to be more desirable, in order to maximize audience exposure for their advertisers. Digital tiers are typically offered to subscribers for an extra monthly charge, and thus have much lower audience exposure. As of June 2003, only about 20.6 million of the 65.9 million cable subscribers in the US, or about 31%, actually received any digital tier programming.¹³ Tier positioning is an important source of friction in basic network/operator negotiations, suggesting that vertical ownership may lead to a greater tendency for an integrated basic network to be carried on an analog tier, and a rival network on a digital tier.¹⁴

For subscription, or “pay” networks that do not offer advertising, carriage on an analog tier increases the potential subscribership because consumers do not need to

¹⁰ Federal Communication Commission (2004), paragraph 9.

¹¹ Federal Communication Commission (2004), paragraph 16.

¹² See Goolsbee and Petrin (2004) for an empirical analysis of the effects of DBS competition on cable television.

¹³ This proportion is obtained by dividing the number of digital cable subscribers (20.6 million) by the number of basic cable subscribers (65.9 million). See Table 1 and paragraph 41 of Federal Communication Commission (2004).

¹⁴ See, for example, *Cable Program Investor* (Kagan Research, LLC), October 22, 2004, p. 1.

buy the digital tier to get the network.¹⁵ Placement of an attractive service on a digital tier can be in the interest of a cable system since it increases the value of subscribing to the digital tier. Other things equal, however, the marginal efficiency advantage to a cable operator of placing a premium network on an analog instead of a digital tier is likely to be higher if the operator owns the network. This is because the operator earns net revenue from each sale of the network in addition to the revenue from digital tier sales. Such a strategy is also consistent with an anticompetitive model since placement of a rival's network on a digital tier can disadvantage the rival by limiting demand for it.

Placing a rival network on a digital tier can also be seen as an indirect method for charging a higher retail price to consumers for the rival network that is more desirable from a marketing perspective. Although an operator's optimal strategy of pricing an integrated network and a similar rival that are offered side-by-side on the same tier is not clear, it is reasonable that the operator would desire to charge a higher price for the rival because the perceived wholesale price of the integrated network is lower.¹⁶ Such a side-by-side price differential, however, might send an undesirable negative quality signal to consumers about the lower priced, integrated network. Effectively higher pricing of the rival through separate tier placement can probably avoid that negative signal. An analogous argument applies to a cost raising strategy.

Another program positioning issue involves networks, such as Encore or Sundance Channel, that are offered by some systems as a basic service, and by others as a premium service. In that case, an integrated system could find it advantageous to position a rival network on a basic instead of a premium tier, or vice versa, in order to increase demand for a similar affiliated network, or in order to raise costs of the rival. In comparison to the analog vs. digital case, it is less evident what the specifics of

¹⁵ The 1992 Cable Act prohibit cable TV operators from requiring purchase of any programming tier other than the basic tier for access to any programming service offered on an a la carte or pay-per-view basis. This limits the strategic options of cable operators to position premium networks only on a digital tier, but that strategy can typically be accomplished by offering those networks only as part of a package of digital programming having one price for the package. See FCC, Consumer Options for Selecting Cable Channels and the Tier Buy-through prohibition, Information Sheet, February, 2003.

¹⁶ Salinger (1991) shows that if a downstream monopoly retailer vertically integrates with one of two substitute products, thereby reducing the effective wholesale price of the integrated product, nearly any changes in optimal relative retail prices of the two products are theoretically possible.

such a basic vs. premium tier strategy would be. We also point out that all programmers are able to influence the positioning decisions of cable operators by design changes in their networks' programming, or by setting differential wholesale pricing, with respect to premium vs. basic tier carriage, or with respect to digital vs. analog carriage. These mechanisms are quite imperfect, however, rendering the tier positioning of cable networks an important component of operators' strategies.

III Selection of Networks and MSOs for Study

To investigate the extent of possible vertical foreclosure in the cable television market, we focus on the two largest MSOs, Comcast and Time Warner. Together, these firms accounted for about one third of all cable subscribers. They also accounted for the large majority of all vertical ownership affiliations with cable programming networks.¹⁷

We selected four groups of programming networks for investigation. One criterion was that within each group, one or more of the networks was vertically affiliated with either Comcast or Time Warner, while other networks in the group were unaffiliated with either. Our second criterion was that networks in the group belonged to a distinct market segment, within which the networks could be presumed to be reasonably close substitutes.

The four network groups we selected are displayed in Table 1, along with launch dates of the individual networks. Within the outdoor entertainment segment, Outdoor Life Network (OLN), owned by Comcast, and the independently owned Outdoor Channel, are basic networks with advertiser support that have offered generally similar program menus in fishing, boating and other outdoor sports and activities. Similarly for the second category, cartoons. The better established Cartoon Network, owned by Time Warner, has competed head to head with Toon Disney as an advertiser-supported basic network for a number of years. The third segment, basic

¹⁷ Among the 110 vertically-integrated cable networks in 2003, 62% of them, or 68 networks, were affiliated with either Time Warner or Comcast. (Source: authors' calculation based on numbers from Federal Communication Commission, 2004, paragraph 143.) Other MSOs that also hold equity interest in at least one cable network include Cablevision, Cox and Liberty Media.

movie services, is somewhat broader, but all four of the services we include specialize in classic or other older Hollywood films (notably Turner Classic Movies, American Movie Classics, and Fox Movie Network), or more contemporary but generally out of the mainstream theatrical films (notably Independent Film Channel, IFC). These four networks are entirely or mainly sold by cable systems as part of basic or expanded basic tiers, although only IFC and AMC sell advertising.¹⁸ Time Warner obtained 100% ownership of TCM through its merger with Turner Broadcast System (TBS) in 1996. Both AMC and IFC are owned by another MSO, Cablevision, which has a relatively small national market share (3.1%) in 2003.¹⁹ The fourth group, premium (or pay) movie-based networks, is the largest and arguably most diverse segment. The two longest established rivals, HBO and Showtime, offer some original series in addition to their main menu of recent Hollywood features. The others all specialize in relatively recent major films, although Flix, Sundance, and Encore (sometimes known as “mini-pays”) generally charge lower prices and have less generally attractive, or less mainstream movies. None of the networks in this group carry advertising and all are sold as premium subscription networks in most or at least a large minority of cases.²⁰

These four groups of programming networks which we study is a small subset of all cable networks in the video programming market. Others are excluded for a variety of reasons. We do not consider the general-interest cable networks (eg, USA Network, TNT and TBS), because we judged their content to be too diverse. Cable news services (including CNN, Fox News, and CNBC) are more distinct but had become

¹⁸ Cable Program Investor, (Kagan Research, LLC), March 15, 2004, p. 3. For both networks, advertisement is only a minor source of their revenue. In 2003, 14% of IFC’s total revenue was from advertisement, and advertising was 28% for AMC.

¹⁹ Fox Movie Channel is owned by News Corp., which acquired Direct TV in 2004. The data used for our analysis reflect the market condition prior to that merger.

²⁰ Unlike the four oldest premium networks (HBO, Cinemax, Showtime, and The Movie Channel), Starz!, Encore, Flix, and Sundance Channel may sometimes be included in a cable system’s basic program package (see next section for more detail). Since these networks are not ad-supported and a significant number of cable systems still treat them as pay services along with the other four, we will follow the convention by calling them premium networks.

Showtime, The Movie Channel, Flix, and Sundance Channel are owned by Viacom Inc., which formerly held hold cable system assets. However, Viacom divested all its cable systems in 1996. Starz! and Encore are both owned by Liberty Media, which holds cable system assets through its ownership of Cablevision of Puerto Rico. Since our dataset does not include any cable systems in Puerto Rico, Starz! and Encore are non-integrated networks with respect to our study. When offered on analog tiers, premium networks are typically sold a la carte. When offered only on digital tiers, premium networks are often sold as part of a package of similar pay networks.

almost ubiquitous by 2003. Sports and music networks lacked significant ownership affiliations with MSOs. Nevertheless, the evidence presented in this paper must be interpreted as examples of certain type of behaviors by the vertically integrated cable operators rather than a complete picture of vertical integration of the cable television market.

We proceed to analyze cable operators' program carriage decisions at two levels. First, we examine whether Comcast and Time Warner have a greater likelihood of including their vertically affiliated networks in their program menus--and of most interest, whether they are less likely to carry unaffiliated rival networks. Second, conditional on their decisions to carry a given network, we investigate whether integrated MSOs are more likely to place an affiliated network on a tier that advantages that network, and are less likely to do so for an unaffiliated rival. In our positioning analysis, we focus on analog vs. digital tier placement, but include some study of basic vs. premium tier placement.

IV Data Sources and Description

Our main data source is the *Television and Cable Factbook* (2004; the *Factbook* hereafter) published by Warren Communication News, Inc. The *Factbook* is an annual volume that contains detailed information concerning cable operator's program carriage information for over 11,000 local cable systems in the United States. In particular, the *Factbook* reports what program packages are offered to a cable system's subscribers (e.g. analog or digital, basic or premium), what networks are included in each package, and the number of subscribers the network has. The *Factbook* also contains information about the geographic location, MSO ownership, availability of digital service, and certain other demand or cost-related characteristics of systems that we use in our models below.

Table 2 gives descriptive statistics for the various ownership, demographic and system-specific explanatory variables that we use in this study. Variables defined as "system" level, such as miles of plant or TV market ranking, are all from the *Factbook* and directly describe the specific local system or franchise area. These data

are supplemented by demand or cost-related demographic information from the U.S. Census Bureau, such as median household income and population density, but at the county level. (The variables in Table 2 are discussed further below.)

A sample of 680 observations with complete information for the model variables was first randomly drawn from the 2004 *Factbook*. For cable systems owned by Comcast and Time Warner, only those shown to offer digital services were included in the sample. A shortcoming of the *Factbook* is that the information contained may not be complete or fully updated each year. As a result, some cable systems may appear in the *Factbook* not to offer digital services when they actually do. For example, the 2004 *Factbook* indicates that Comcast's cable systems serving the Los Angeles areas do not offer a digital basic package. In fact, as of the end of 2003, over 95% of all Comcast's cable systems had been upgraded to allow for two-way digital video and Internet services, which included those serving Los Angeles.²¹ Similarly, as of the end of 2003, over 99% of Time Warner's cable systems offered digital video services.²² Therefore, any records showing that the cable systems owned by these two MSOs do not offer digital services are likely to be out of date and thus were excluded from our sample. To the extent that the availability of digital services will increase a cable system's probability of carrying any given programming network, this data selection may lead to an overestimation of Comcast and Time Warner's likelihood of carrying the networks under examination. Therefore, if any exclusion is found from the data, the actual magnitude may be even greater. Our results thus may be biased against findings that rival networks are disadvantaged by non-carriage or disadvantageous positioning.

As indicated in Table 2, 83% of the cable systems in our sample offered digital video service to their subscribers. About 20% of the systems were owned by Comcast and 10% by Time Warner. These proportions reflect the actual national market conditions reasonably well.²³

²¹ Comcast 2003 Annual Report.

²² Time Warner 2003 Annual Report.

²³ As of the end of 2003, Comcast and Time Warner respectively served 22.69% and 11.62% of all basic cable subscribers

Table 3 provides a cross tabulation of cable systems' program carriage information by MSO for the four network groups. The proportion of Comcast systems that carried OLN in 2004 is substantially higher, and the proportion that carried Outdoor Channel substantially lower, than for unaffiliated MSOs. We also include in Table 3 data for outdoor entertainment network carriage on AT&T systems in 2001. These earlier carriage data reflect relatively recent changes in the ownership structure for OLN. OLN was originally launched by AT&T Broadband and Cox Communications and then Comcast acquired full ownership of this network in 2001.²⁴ In the same year, Comcast merged with AT&T Broadband, a process completed in 2002. To distinguish the possibly different behaviors by Comcast and AT&T, we thus conduct a supplemental statistical analysis using data before Comcast's ownership involvement. The needed information on cable systems' characteristics and their program carriage decisions on Outdoor Channel and OLN is extracted from the 2001 *Factbook* for exactly the same cable systems that are contained in the later sample, according to a unique system identification number. Since the acquisition of OLN by Comcast did not happen until October 2001 and the merger between Comcast and AT&T Broadband was completed in 2002, the information contained in the 2001 *Factbook* reflects market conditions when AT&T, but not Comcast, was vertically affiliated with OLN.

The 2001 data for the outdoor networks in Table 3 show a similar pattern to that of Comcast's carriage in 2004. The proportion of systems owned by AT&T that carried OLN in 2001 is much higher than that for other cable systems. The difference between AT&T and the other cable systems in their propensity to carry the rival Outdoor Channel, however, is not as large as with Comcast in 2004.

For Time Warner, the 2004 network carriage picture is mixed. For both the cartoon and basic movie segments, Time Warner systems have a greater likelihood of carrying their affiliated services (Cartoon and TCM, respectively), but also a greater tendency to carry rivals AMC, Fox, and Toon Disney. Time Warner's tendency to

²⁴ In May 2001, Fox Entertainment Group acquired a 50% of the stake of Outdoor Life Network, and then sold it to Comcast in October 2001. The merger between Comcast and AT&T Broadband in the same year eventually made OLN a wholly-owned subsidiary of Comcast.

offer rival IFC is slightly lower than that of other MSOs. For premium networks, all cable operators' carriage rates are very high for the four oldest services (HBO, Cinemax, Showtime, and The Movie Channel), although Time Warner systems offered all of them at least slightly more frequently. The situations are different for the four newer premium services, which have lower carriage rates on average. Time Warner systems were less likely to carry Encore, and more likely to carry Starz!, while differences in the carriage rates of Flix and Sundance Channel were negligible.

Table 4 summarizes the proportions of cable systems that include the subject networks in the analog program tier-- given that the networks are actually carried and that the cable system offers at least one digital package. These data show that the proportions of Comcast systems that carry their affiliated service, OLN, in the analog tier and that carry rival Outdoor Channel in the digital tier are higher than for other cable operators. A similar pattern is observed for Time Warner. For the affiliated basic movie service, TCM, analog tier carriage rates are relatively high for Time Warner systems, and digital carriage rate higher for the rival Toon Disney channel. Positioning differences for the other networks, however, are relatively minor. For the premium networks, the data show a general pattern that the more established networks (like HBO, Cinemax, Showtime, and The Movie Channel) are more likely to be placed in the analog tier than the relatively new services. The data also show that Time Warner has a lower analog tier carriage rate for all the eight premium services considered--including its affiliated services, HBO and Cinemax.

Finally, Table 5 shows the proportion of cable systems that offer the various movie-based networks in the premium group as premium services vs. carriage as part of a basic or expanded basic package. The five major premium networks are almost never offered to their subscribers as part of a basic program package by any cable system. The mini-pays, Encore, Flix, and Sundance, however, are frequently offered as part of a basic package. Time Warner systems tend to offer Encore more frequently and Sundance less frequently as a basic service in comparison to other systems. Among the basic movie network group, TCM and AMC are always part of a basic service. Notably, however, Time Warner is the only cable operator that offers Fox and

IFC as premium services, and it does so in a substantial number of cases.

These raw data tabulations for network carriage and positioning suggest that there may exist systematic behavioral differences between MSOs vertically affiliated with networks within a group and those without such affiliations. We now proceed to a regression analysis to isolate such differences by taking into account system-specific and demographic variables as well as network ownership information.

V. Empirical Models

To analyze the effects of system ownership on network carriage patterns, we estimate reduced-form probit models of the following form:

$$\begin{aligned} CARRIAGE_i = & a + b * RANK_i + c * LSIZE_i + d * LAGE_i + e * LHPASS_i \\ & + f * LMILES_i + g * LCAPACITY_i + h * DIGITAL_i + j * LINCOME_i + k * LPOP_i + l * YOUNG_i \\ & + m * OLD_i + n * NONWHITE_i + o * HHSIZE_i + p * RENTER_i + q * MSO_i + \varepsilon_i, \end{aligned}$$

where the variables have the following definitions (see Table 2 for additional information):

- *CARRIAGE*: dummy variable indicating whether a cable network under analysis is carried by system *i*;
- *RANK*: TV market ranking, with lower numbers indicating larger TV markets;
- *LSIZE*: natural logarithm of system owners' (MSOs') horizontal size, measured by the percentage of basic subscribers served nationally;
- *LAGE*: natural logarithm of system age, measured by the number of months since franchise began;
- *LHPASS*: natural logarithm of home passed;
- *LMILES*: natural logarithm of miles of cable plant;
- *LCAPACITY*: natural logarithm of analog channel capacity;
- *DIGITAL*: dummy variable indicating whether digital services are available;
- *LINCOME*: natural logarithm of median household income for the county in which system *i* operates;

- *LPOP*: natural logarithm of population density for the county in which system *i* operates, measured by the number of persons per square mile;
- *YOUNG*: percentage of households with individuals under age 18 in the county in which system *i* operates;
- *OLD*: percentage of households with individuals over age 65 in the county in which system *i* operates;
- *NONWHITE*: percentage of non-white population in the county in which system *i* operates;
- *HHSIZE*: average household size in the county in which system *i* operates, measured by the number of persons per household;
- *RENTER*: percentage of households that rent their homes in the county in which system *i* operates;
- *MSO*: dummy variable indicating whether cable system *i* is owned by Comcast, Time Warner, or AT&T as appropriate.

This group of independent variables is similar to that used in other studies of cable system carriage and marketing behavior by Chipty and Waterman and Weiss. In general, we expect that higher channel capacity and availability of digital service will be unambiguously associated with greater likelihood of any network's carriage. Other things equal, systems with higher population density, greater miles of plant, more homes passed, and that are owned by larger MSOs should have higher likelihood of network carriage to the extent that economies of scale lower system costs. A larger MSO, however, could also tend to reduce carriage of rival networks for anti-competitive reasons. In addition, these cost-related variables may proxy for various unknown demand factors. Turning to direct demand-related variables, higher income and the presence of younger family members are generally associated with higher cable demand. Note, however, as suggested by results of previous empirical studies, that the carriage of any particular network does not necessarily rise with stronger general demand. A market with higher income subscribers, for example, may induce a cable operator to offer a larger number of premium networks relative to basic networks, so that carriage of a given basic network may fall with income. It is

difficult to predict the effects of TV market ranking, system age, or the proportion of renters on demand. All the independent variables in the model, however, plausibly affect costs and demand in cable markets and thus network carriage.

For the positioning models, we estimate *A-CARRIAGE* or *B-CARRIAGE*, as a function of almost the same sets of independent variables, where *A-CARRIAGE* is a dummy variable indicating whether a cable network under analysis is carried by system *i* in the analog tier; and *B-CARRIAGE* is a dummy variable indicating whether a cable network under analysis is offered by system *i* in a basic program package. For the positioning estimations that involve *A-CARRIAGE*, we only include the observations for systems that offer at least one digital service. Therefore, in the estimation of those models, the variable indicating the availability of digital services (*DIGITAL*) is dropped.

Greater analog channel capacity should unambiguously encourage the carriage of any given network on an analog tier. Expected signs of other independent variables, however, are difficult to predict. The use of logarithmic forms of some independent variables reflects our expectations that these variables will have diminishing marginal effects on carriage or positioning decisions.

VI Channel Carriage and Positioning Results

A. Basic Outdoor Entertainment Networks

We first investigate Comcast's probability of carrying its corporate relative OLN and of carrying the unaffiliated Outdoor Channel, in comparison to cable operators without an equity interest in either network. The key explanatory variable is a dummy indicating whether a cable system is owned by Comcast or not as of 2004, or by AT&T in 2001. Since the MSO, Cox Communication, is also one of the previous owners of OLN, models were estimated with and without the Cox observations. The estimation results are in Table 6.

As expected, digital tier availability has a highly significant positive influence on outdoor channel carriage in all eight carriage models, although somewhat less so in 2001 when digital tiers were far less widely available. Channel capacity is

unexpectedly insignificant in all models, although this result may be due to positive correlation with digital service availability. If the variable indicating digital services is dropped from these models, the estimate for the channel capacity variable becomes positive in all eight cases, and strongly significant in four.²⁵ Most other cost and demand-related variables have weak or no significance, or have unexpected signs, a pattern of results similar to that produced for similar variables by the Waterman and Weiss and Chipty studies. A similar pattern of results also characterizes other models in this study reported below.

The effects of Comcast's ownership on carriage of outdoor entertainment networks generally confirms patterns observed in the descriptive data, and are almost identical with or without the potentially confounding Cox observations. In 2004, Comcast was about 20% more likely to carry OLN than other MSOs, and about 30% less likely to carry its rival, Outdoor Channel.

For the 2001 models, results are similar, although the estimated marginal effects of AT&T ownership on carriage of OLN and Outdoor Channel are much lower. This result suggests that the availability of digital tiers, although they encourage carriage of all networks, does not make it less likely in relative terms for an integrated cable operator to engage in the exclusion of its rival networks.

For the 2004 analysis of analog vs. digital tier positioning, neither the OLN nor the Outdoor Channel models indicate statistically significant differences in placement of these networks by Comcast systems (Table 7).²⁶

B. Basic Cartoon Services

Carriage models reported in Table 8 for carriage of the two basic cartoon networks indicate a pattern different than that of the outdoor networks. Corrected for other factors, Time Warner is about 16% more likely to carry its affiliated network,

²⁵ The estimation results are available from the authors upon request.

²⁶ The insignificant Outdoor Channel result could be due to collinearity of the Comcast dummy with the MSO size variable, which has high significance in that model. We re-estimated the same model without the MSO size variable and found that the coefficient for the Comcast dummy became strongly negative and significant, consistent with the descriptive data. Re-estimation of all of models reported in this article without the MSO size variable (which has fairly erratic signage and significance) results in very few other substantive differences in the signage or significance of the MSO-specific dummies.

Cartoon Network, than other MSOs, but contrary to the foreclosure hypothesis, 29% more likely to offer its rival Toon Disney. Also shown by these models is that carriage of Toon Disney by MSOs on average is 55% higher for systems having a digital tier, while carriage of the older, better established Cartoon network is only about 5% more likely with the presence of digital service. The latter results clearly reflect the far greater dependence of the newer Toon Disney network on digital carriage, as indicated by the descriptive data in Table 4.

As indicated by Model 3 in Table 8, however, Time Warner systems that carry Toon Disney, are about 25% more likely than other cable operators to offer it only on a digital tier. This result suggests that although Time Warner's carriage of its rival network Toon Disney is relatively high, that MSO systematically positions this network in a way that limits its audience reach. By contrast, virtually all cable systems that carry Cartoon Network offer it on an analog tier, undoubtedly reflecting the earlier launch and rapid growth of this service in the early 1990s. (A statistical model for positioning of Cartoon Network could not be estimated since it has virtually no digital tier carriage.).

C. Basic Movie Channels

As shown in Table 9, Time Warner systems were about 13% more likely to carry their well-established vertical affiliate, TCM, than was the average system (Model 1). Among its three rivals, Time Warner's carriage of AMC was not significantly different, but was much higher (28%) for Fox Movie Channel (FMC), and significantly lower (18%) for IFC. In our sample, IFC is not carried by any cable system that does not offer at least one digital package. Therefore, the variable indicating the availability of digital services is perfectly correlated with the dependent variable and thus is dropped from the estimation. To control for the effect of digital capabilities, we re-estimated the model for IFC by using only the observations for the systems that offer at least one digital service. The results (Table 9, Model 5) show that, by considering only those digitally able systems, the exclusion of IFC by Time Warner becomes greater, the marginal effect increasing from -18% to about -24%..

The statistically neutral results for AMC carriage contrast with those obtained by Chipty (2001), who found statistically significant exclusion of AMC by the owners of premium movie networks, including Time Warner. This discrepancy is not surprising, however, in that Chipty's study using 1991 data reflecting AMC's then more nascent national cable penetration of 32% (Chipty, 2001, p. 439). Judging from our sample, AMC's national penetration had reached about 90% by 2004, likely elevating it to the status of a "must-have" channel, and thus making its exclusion unprofitable for most systems by that time.

Lower than average carriage estimates in Table 9 for IFC on Time Warner systems appear consistent with the foreclosure hypothesis, but that MSO's much greater than normal carriage of FMC is contrary to foreclosure.²⁷

The FMC result seems especially unconvincing to the foreclosure model because its program menu--mostly old movies that were produced in the 1930s to the 1970s--seems very similar to that of TCM. Further analysis is less dismissive of the foreclosure model, however: TCM and FMC are rarely placed on the same program tier by Time Warner. Table 4 shows that about 87% of the cable systems owned by Time Warner include TCM in the analog tier, while 94% of that MSO's systems which choose to carry FMC offer that network on a digital tier. Also, as shown by Table 5, Time Warner is the only cable operator to offer FMC as a premium service, a strategy Time Warner followed in about one third of all instances in which FMC was given carriage. Moreover, FMC was also on a digital tier in virtually all of these premium pricing cases. In contrast, Time Warner always placed TCM on a basic tier.

Some further insight into TCM/FMC positioning is gained from Model 6 of Table 9, which reports estimated MSO differences in carriage of FMC only for the basic tier. That model indicates statistically neutral, rather than significantly positive, differences in Time Warner's carriage of FMC in comparison to other MSOs. Time Warner's relatively more generous carriage of FMC is thus confined to that network's carriage as a (digital tier) pay network.

²⁷ To make sure that results for Independent Film Channel are not distorted due to its partial ownership by Cablevision, we also estimate the IFC models excluding the observations for the cable systems owned by Cablevision. The results remain virtually unchanged. (The results are available upon request from the authors.)

Although Table 4 indicates that tier separation of TCM and FMC also tends to occur on cable systems having no vertical affiliation with TCM, the separations are sharper on Time Warner systems, due in large part to the much higher than average Time Warner system carriage of TCM on an analog tier, as indicated in Table 4.²⁸

Turning again to IFC, the 24% less frequent carriage of that network by Time Warner systems indicated by Model 5 of Table 9 may also understate the practical level of IFC's foreclosure from Time Warner systems. The descriptive data of Table 5 show that similar to the Fox Movie Case, Time Warner carried IFC as a premium channel in about one third of cases where any carriage was given, a strategy also not followed by any other MSO. As in the FMC cases, Time Warner's offerings of IFC as a premium network were in virtually all cases via a digital tier. Model 7 of Table 9 shows that when only the cases in which IFC was carried on a basic tier are considered, Time Warner systems offered IFC still less frequently (an estimated -36%), than the average system.²⁹

The lack of relevant cases did not permit analog vs. digital tier positioning models to be statistically estimated for any of the basic movie networks except TCM.³⁰ As the descriptive data in Table 4 suggest would be the case, Model 8 of Table 9 shows that Time Warner systems were statistically much more likely (38% more) to offer TCM on an analog tier than was the average system.

Marketing of cable networks is too complex, and the relevant substitution effects too murky for us to confidently conclude that foreclosure occurs in the case of these basic networks. All of these networks, for example, may also be viewed by cable operators as potential competitors to their premium network offerings. We have advanced above, however, plausible explanations for how foreclosure involving basic

²⁸ When Fox Movie Channel and Independent Film Channel are offered as premium services by Time Warner, they are invariably included in the digital tiers. Accurate information on the number of subscribers to these two networks is not available. However, using the national level figures for the penetration rate of digital services (31%) and the proportion of basic cable subscribers that have access to premium networks (53%), we can obtain a rough estimate for the proportion of basic cable subscribers that also subscribe to these two movie services in those local markets, which is about 16%.

²⁹ When only basic level digital tier carriage situations are considered, Time Warner systems are 43% less likely to offer IFC. The estimation results are available from the authors upon request.

³⁰ In the former case, there was only one cable system, which is owned by Time Warner, that does not include American Movie Classics in the analog program package. Due to the lack of data variation, the probit estimation is not feasible. In the latter case, only five cable systems in our sample include Independent Film Channel in the analog package, and the probit estimation is unsuccessful for the same reason.

movie networks may take place through positioning as well as carriage practices.

D. Premium Network Carriage

Finally, we consider Time Warner's carriage decisions involving the eight movie-based premium networks. Nearly ubiquitous carriage of HBO and Cinemax by U.S. cable systems prohibits estimation of carriage models for those Time Warner-owned networks. We were, however, able to estimate carriage models for the six rival networks unaffiliated with Time Warner (Table 10). Non-ownership variables indicate a pattern similar to the basic network models reported previously. Signage is negative for the Time Warner ownership variables in all six models, though carriage is significantly negative and of notable magnitude (ranging from 14% to 18%) only in the 3 "mini-pay" cases. In all three of the statistically insignificant cases, however, carriage differences are unlikely to be sharp because of the generally very high national penetration rates of those networks (Table 3).

We were able to estimate analog vs. digital tier positioning models for all eight networks in the premium group (Table 11). Contrary to the foreclosure hypothesis, Time Warner carried HBO on an analog tier 11% less frequently than did the average cable system. The sign was also negative, though statistically insignificant, for Cinemax. In three of the six other cases (Encore, Starz and TMC), however, Time Warner is shown to be less likely to include those networks on the analog tier, while results were not significantly different for the other three networks.

There is a final piece to the premium network positioning puzzle. As the models in Table 12 indicate, Time Warner systems offer Encore more frequently as a basic network, and Sundance much less frequently as a basic network, than does the average system. Differences for Flix were insignificant and basic vs. premium models could not be estimated for the other networks in the premium group.

Overall, premium network carriage and analog vs. digital carriage patterns are generally consistent with a foreclosure model, although results are insignificant in several cases and contrary to the hypothesis in at least the HBO positioning case. These results indicate that further studies on this issue are still needed.

VII. Summary and conclusions

While there are some notable exceptions, the carriage and network positioning patterns we have analyzed in this study are generally consistent with the vertical foreclosure hypothesis as we have defined it. In each of the four network groups studied—basic outdoor entertainment, basic cartoon, basic movie and premium movie networks--vertically affiliated networks were almost uniformly favored by Comcast, Time Warner, and AT&T in terms of higher carriage and/or more frequent positioning on analog program tiers that are more widely available to consumers. In a majority of cases, unaffiliated networks that we identified to be rivals to these integrated networks were carried less frequently and they were more often placed on limited-access digital tiers.

We have confined our study to a series of example network groups, and mainly to the behavior of only two MSOs. We also did not attempt to systematically measure changes in foreclosure behavior over time, although it appears that in cases like AMC, the extent of foreclosure tends to diminish when a network survives to become well established in the market. Overall, however, the bulk of evidence in this paper is that vertical foreclosure remains a persistent phenomenon in the U.S. cable television industry--in spite of great increases in channel capacity and digitization, as well as competition from DBS. To our knowledge, ours is the first systematic empirical study to document foreclosure patterns in cable television in the new competitive environment of digital tiering.

We believe that a unique contribution of this study is our demonstration that vertical foreclosure in the modern cable industry cannot be understood only in terms of network carriage differentials. Integrated systems have the ability to reduce competition for their affiliated networks, or to disadvantage rival networks, in a variety of ways other than the yes-or-no carriage decision—notably tier placement. It was not possible to conclude from this study whether the foreclosure patterns we observe are efficiency or anti-competitively motivated, or whether consumers are on net better off or worse off as a result. Questions also remain about the extent to which

unaffiliated cable networks are in fact disadvantaged by receiving digital vs. analog tier placement, or especially by basic vs. premium positioning. These questions are worthy of more detailed study.

Table 1 Programming Networks for Analysis

Market Segment	Programming Network	MSO Ownership (%)	Launch Date	Subscribers (mil)
Outdoor	<i>Outdoor Life Network</i>	Comcast (100)	Jul-95	52.2
Entertainment	<i>Outdoor Channel</i>	-	Apr-93	23.1
Basic Movie Service	<i>Turner Classic Movies</i>	Time Warner (100)	Apr-94	63.8
	<i>American Movie Classics</i>	Cablevision (60)	Oct-84	83.6
	<i>Independent Film Channel</i>	Cablevision (60)	Sep-94	26.8
	<i>Fox Movie Channel</i>	-	Nov-94	24.7
Cartoon	<i>Cartoon Network</i>	Time Warner (100)	Oct-92	83.0
	<i>Toon Disney</i>	-	Apr-98	39.4
Premium Network	<i>HBO</i>	Time Warner (100)	Nov-72	20.5
	<i>Cinemax</i>	Time Warner (100)	Aug-80	8.0
	<i>Showtime</i>	-	Jun-76	8.7
	<i>The Movie Channel</i>	-	Dec-79	5.8
	<i>Encore</i>	-	Apr-91	13.8
	<i>Starz!</i>	-	Mar-94	7.6
	<i>Flix</i>	-	Aug-92	6.7
	<i>Sundance Channel</i>	-	Feb-96	9.9

Source: Federal Communication Commission (2004); Kagan World Media (2003), Cable Program Investor, June.

Notes: The number of subscriber information is as of June 2003.

Table 2 Variable Definitions and Descriptive Statistics (N = 680)

Variable	Empirical Measure	Level	Mean
Demographic variables			
Population density	Number of persons per square mile	County	601.80
Income	Median household income	County	38021.64
Younger viewership	Percentage of households with individuals under age 18	County	35.37
Older viewership	Percentage of households with individuals over age 65	County	25.88
Non-white viewership	Percentage of population non-white	County	17.72
Average household size	Persons per household	County	2.54
Renter	Percentage of households that are renters	County	27.65
Cable system specific variables			
TV market ranking	Lower numbers indicate larger TV markets Rankings exceeding 100 are coded as 100	System	69.40
System age	Number of months since franchise began	System	340.35
System size	Home passed	System	41659.21
Owner's horizontal size	The percentage of basic subscribers served nationally by the MSO	System	7.83
Miles	Miles of cable planted	System	490.78
Capacity	Analog channel capacity	System	64.43
Digital service	Availability of digital video service	System	0.83
Comcast ownership	The percentage of systems owned by Comcast	System	19.85
Time Warner ownership	The percentage of systems owned by Time Warner	System	10.44

Notes: In the case of joint ownership, the cable system is treated as owned by Comcast or Time Warner if either of them is one of the owners. The information on pricing and subscribership is not available for all observations. For those variables, the mean was calculated based on the observations with this information only.

Table 3 Descriptive Statistics: Program Carriage

	2004		2001	
	Comcast	Other	AT&T	Other
<i>Outdoor Life Network</i>	94.07%	61.83%	18.46%	5.21%
<i>Outdoor Channel</i>	38.52%	62.39%	4.62%	5.41%
	Time Warner	Other		
<i>Turner Classic Movies</i>	98.59%	77.83%	-	-
<i>American Movie Classics</i>	98.59%	88.67%	-	-
<i>Fox Movie Channel</i>	64.79%	40.39%	-	-
<i>Independent Film Channel</i>	56.34%	58.95%	-	-
<i>Cartoon Network</i>	97.18%	74.22%	-	-
<i>Toon Disney</i>	92.96%	59.28%	-	-
<i>HBO</i>	100.00%	99.67%	-	-
<i>Cinemax</i>	100.00%	94.75%	-	-
<i>Showtime</i>	98.59%	92.61%	-	-
<i>The Movie Channel</i>	98.59%	86.86%	-	-
<i>Flix</i>	46.48%	45.48%	-	-
<i>Sundance Channel</i>	43.66%	43.68%	-	-
<i>Starz!</i>	95.77%	79.97%	-	-
<i>Encore</i>	74.65%	80.95%	-	-

Table 4 Descriptive Statistics: Program Positioning – Analog vs. Digital

	Comcast		Other	
	Analog	Digital only	Analog	Digital only
<i>Outdoor Life Network</i>	42.52%	57.48%	35.15%	64.85%
<i>Outdoor Channel</i>	5.77%	94.23%	26.18%	73.82%
	Time Warner		Other	
	Analog	Digital only	Analog	Digital only
<i>Cartoon Network</i>	100.00%	0.00%	99.75%	0.25%
<i>Toon Disney</i>	3.03%	96.97%	34.01%	65.99%
<i>Turner Classic Movie</i>	87.14%	12.86%	53.44%	46.56%
<i>American Movie Classics</i>	98.57%	1.43%	100.00%	0.00%
<i>Fox Movie Channel</i>	5.97%	94.03%	7.69%	92.31%
<i>Independent Film Channel</i>	2.50%	97.5%	1.11%	98.89%
<i>HBO</i>	53.53%	46.47%	70.68%	29.32%
<i>Cinemax</i>	50.70%	49.30%	59.62%	40.38%
<i>Showtime</i>	50.00%	50.00%	58.86%	41.14%
<i>The Movie Channel</i>	20.00%	80.00%	40.26%	59.74%
<i>Starz!</i>	17.65%	82.35%	28.66%	71.34%
<i>Encore</i>	12.31%	87.69%	32.60%	67.40%
<i>Flix</i>	6.06%	93.94%	8.19%	91.81%
<i>Sundance Channel</i>	2.78%	97.22%	3.96%	96.04%

Notes: Percentages were calculated given that the networks are carried and that the cable system offers at least one digital service.

Table 5 Descriptive Statistics: Program Positioning – Basic vs. Premium

	Time Warner		Other	
	Basic	Premium	Basic	Premium
<i>HBO</i>	0.00%	100.00%	0.00%	100.00%
<i>Cinemax</i>	0.00%	100.00%	0.00%	100.00%
<i>Showtime</i>	0.00%	100.00%	0.00%	100.00%
<i>The Movie Channel</i>	0.00%	100.00%	0.00%	100.00%
<i>Starz!</i>	0.00%	100.00%	2.44%	97.56%
<i>Encore</i>	52.31%	47.69%	23.40%	76.6%
<i>Flix</i>	18.18%	81.82%	18.86%	81.14%
<i>Sundance Channel</i>	50.00%	50.00%	68.35%	31.65%
<i>Turner Classic Movie</i>	100.00%	0.00%	100.00%	0.00%
<i>American Movie Classics</i>	100.00%	0.00%	100.00%	0.00%
<i>Fox Movie Channel</i>	68.09%	31.91%	100.00%	0.00%
<i>Independent Film Channel</i>	64.29%	35.71%	100.00%	0.00%

Notes: Percentages were calculated given that the networks are carried.

Table 6 Carriage of Outdoor Entertainment Networks

	Year 2004								Year 2001							
	OLN		OLN (without Cox)		Outdoor Channel		Outdoor Channel (without Cox)		OLN		OLN (without Cox)		Outdoor Channel		Outdoor Channel (without Cox)	
	(1)		(2)		(3)		(4)		(5)		(6)		(7)		(8)	
<i>RANK</i>	-0.001	(0.001)	-0.001	(0.001)	-0.001	(0.001)	-0.001	(0.001)	0.000	(0.000)	0.000	(0.000)	0.000	(0.000)	0.000	(0.000)
<i>LSIZE</i>	0.044***	(0.013)	0.041***	(0.013)	0.001	(0.014)	0.000	(0.014)	-0.005	(0.004)	-0.006	(0.004)	-0.004	(0.003)	-0.005*	(0.003)
<i>LAGE</i>	0.030	(0.068)	0.016	(0.070)	-0.244***	(0.072)	-0.260***	(0.074)	0.013	(0.024)	0.002	(0.020)	-0.017	(0.018)	-0.020	(0.016)
<i>LHPASS</i>	0.002	(0.037)	-0.007	(0.038)	0.005	(0.036)	0.002	(0.037)	0.026**	(0.012)	0.021**	(0.010)	0.009	(0.011)	0.007	(0.010)
<i>LMILES</i>	-0.004	(0.036)	-0.004	(0.038)	-0.015	(0.035)	-0.006	(0.036)	-0.014	(0.011)	-0.014	(0.009)	-0.004	(0.010)	-0.003	(0.010)
<i>LCAPACITY</i>	0.022	(0.070)	0.011	(0.073)	0.024	(0.069)	-0.009	(0.071)	0.017	(0.024)	0.012	(0.021)	0.031	(0.019)	0.018	(0.017)
<i>DIGITAL</i>	0.729***	(0.039)	0.748***	(0.037)	0.580***	(0.040)	0.597***	(0.040)	0.187***	(0.039)	0.158***	(0.037)	0.114***	(0.024)	0.108***	(0.026)
<i>LINCOME</i>	0.188	(0.157)	0.226	(0.162)	-0.492***	(0.153)	-0.428***	(0.155)	-0.045	(0.048)	-0.018	(0.043)	-0.065	(0.041)	-0.030	(0.037)
<i>LPOP</i>	-0.032	(0.022)	-0.036	(0.023)	-0.019	(0.022)	-0.019	(0.022)	-0.007	(0.007)	-0.006	(0.006)	-0.001	(0.006)	-0.001	(0.005)
<i>YOUNG</i>	0.035***	(0.012)	0.031**	(0.013)	-0.002	(0.009)	-0.004	(0.009)	0.002	(0.002)	0.002	(0.002)	0.003	(0.002)	0.002	(0.002)
<i>OLD</i>	-0.001	(0.006)	-0.002	(0.006)	-0.003	(0.006)	-0.002	(0.006)	-0.001	(0.002)	-0.001	(0.002)	-0.001	(0.002)	-0.001	(0.001)
<i>NONWHITE</i>	0.000	(0.002)	0.000	(0.002)	-0.001	(0.002)	-0.001	(0.002)	-0.003***	(0.001)	-0.002***	(0.001)	-0.001	(0.001)	-0.001	(0.001)
<i>HHSIZE</i>	-1.112***	(0.302)	-1.069***	(0.308)	0.028	(0.232)	0.050	(0.237)	.008	(0.064)	0.010	(0.055)	-0.025	(0.053)	-0.012	(0.050)
<i>RENTER</i>	-0.002	(0.004)	-0.002	(0.004)	-0.004	(0.004)	-0.003	(0.004)	0.004***	(0.001)	0.003***	(0.001)	-0.001	(0.001)	-0.001	(0.001)
<i>COMCAST</i>	0.194***	(0.058)	0.205***	(0.058)	-0.294***	(.060)	-0.310***	(0.061)	-	-	-	-	-	-	-	-
<i>ATT</i>	-	-	-	-	-	-	-	-	0.047	(0.029)	0.062**	(0.031)	-0.548**	(0.318)	-0.021**	(0.010)
<i>N</i>	680		657		680		657		671		648		671		648	
Pseudo R^2	0.3725		0.3754		0.1991		0.2071		0.4519		0.4696		0.2695		0.3167	

Notes: Marginal effects reported with standard errors in brackets. * indicates significance at 10% level, ** at 5% level, and *** at 1% level.

Table 7 Positioning of Outdoor Entertainment Networks

	OLN		Outdoor Channel	
	in analog tier		in analog tier	
<i>RANK</i>	0.001	(0.001)	0.000	(0.001)
<i>LSIZE</i>	-0.003	(0.017)	-0.076***	(0.013)
<i>LAGE</i>	0.031	(0.080)	0.088	(0.075)
<i>LHPASS</i>	0.006	(0.042)	-0.026	(0.044)
<i>LMILES</i>	0.013	(0.042)	-0.024	(0.043)
<i>LCAPACITY</i>	0.165**	(0.080)	0.013	(0.070)
<i>LINCOME</i>	0.410**	(0.179)	-0.527***	(0.183)
<i>LPOP</i>	0.038	(0.027)	0.041	(0.029)
<i>YOUNG</i>	0.002	(0.008)	-0.033***	(0.012)
<i>OLD</i>	-0.002	(0.006)	-0.023***	(0.007)
<i>NONWHITE</i>	0.002	(0.002)	0.004**	(0.002)
<i>HHSIZE</i>	-0.243	(0.261)	0.588	(0.363)
<i>RENTER</i>	-0.006	(0.004)	-0.015***	(0.005)
<i>COMCAST</i>	-0.036	(0.066)	0.023	(0.101)
<i>N</i>	457		369	
Pseudo R^2	0.0588		0.2445	

Notes: Positioning models are estimated only with the observations for systems that actually carry the subject networks and provide digital services. Marginal effects reported with standard errors in brackets.

* indicates significance at 10% level, ** at 5% level, and *** at 1% level.

Table 8: Program Carriage and Positioning of Cartoon Services

	Cartoon Network carriage		Toon Disney carriage		Toon Disney in analog tier	
<i>RANK</i>	0.001*	(0.001)	0.000	(0.001)	-0.001	(0.001)
<i>LSIZE</i>	-0.013	(0.009)	0.009	(0.012)	-0.047***	(0.013)
<i>LAGE</i>	-0.004	(0.053)	-0.059	(0.068)	0.019	(0.067)
<i>LHPASS</i>	0.044	(0.028)	0.017	(0.037)	0.042	(0.040)
<i>LMILES</i>	0.025	(0.027)	-0.036	(0.036)	-0.106***	(0.041)
<i>LCAPACITY</i>	0.221***	(0.049)	0.048	(0.067)	0.018	(0.074)
<i>DIGITAL</i>	0.195***	(0.055)	0.553***	(0.047)	-	-
<i>LINCOME</i>	0.136	(0.108)	0.266	(0.145)	0.010	(0.170)
<i>LPOP</i>	-0.013	(0.016)	-0.007	(0.021)	-0.025	(0.028)
<i>YOUNG</i>	0.010	(0.008)	-0.004	(0.008)	0.007	(0.012)
<i>OLD</i>	0.001	(0.004)	-0.001	(0.005)	-0.019***	(0.007)
<i>NONWHITE</i>	0.002	(0.001)	0.002	(0.002)	-0.001	(0.002)
<i>HHSIZE</i>	-0.470**	(0.200)	-0.152	(0.216)	-0.259	(0.320)
<i>RENTER</i>	0.000	(0.003)	0.002	(0.004)	-0.001	(0.004)
<i>TIME WARNER</i>	0.162***	(0.033)	0.288***	(0.051)	-0.251***	(0.039)
<i>N</i>	680		680		410	
<i>Pseudo R²</i>	0.2319		0.2031		0.2089	

Notes: Positioning models are estimated with the observations for systems that actually carry the subject networks and provide digital services. Marginal effects reported with standard errors in brackets. * indicates significance at 10% level, ** at 5% level, and *** at 1% level.

Table 9 Carriage and Positioning of Basic Movie Channels

	TCM Carriage		AMC Carriage		FMC Carriage		IFC Carriage		IFC Carriage (with digital only)		FMC Carriage (in basic tier only)		IFC Carriage (in basic tier only)		TCM in analog tier	
	(1)		(2)		(3)		(4)		(5)		(6)		(7)		(8)	
<i>RANK</i>	-0.001	(0.001)	0.000	(0.000)	-0.002***	(0.001)	0.001	(0.001)	0.001	(0.001)	-0.002**	(0.001)	0.001*	(0.001)	-0.001	(0.001)
<i>LSIZE</i>	-0.025***	(0.009)	0.011**	(0.005)	0.000	(0.012)	0.096***	(0.012)	0.078***	(0.011)	-0.001	(0.012)	0.097***	(0.012)	-0.069***	(0.014)
<i>LAGE</i>	0.000	(0.046)	0.022	(0.027)	-0.300***	(0.076)	-0.232***	(0.070)	-0.245***	(0.067)	-0.316***	(0.074)	-0.245***	(0.071)	0.168**	(0.079)
<i>LHPASS</i>	0.036	(0.025)	0.010	(0.015)	-0.021	(0.038)	0.120***	(0.035)	0.052	(0.034)	-0.031	(0.037)	0.127***	(0.035)	-0.002	(0.042)
<i>LMILES</i>	-0.035	(0.024)	0.009	(0.014)	-0.013	(0.038)	-0.068**	(0.034)	-0.040	(0.034)	0.007	(0.037)	-0.072**	(0.035)	0.010	(0.041)
<i>LCAPACITY</i>	0.134***	(0.046)	0.030	(0.027)	0.068	(0.071)	0.149**	(0.065)	0.056	(0.064)	0.082	(0.069)	0.159**	(0.066)	0.116	(0.077)
<i>DIGITAL</i>	0.561***	(0.060)	0.044	(0.029)	0.559***	(0.027)	-	-	-	-	0.537***	(0.027)	-	-		
<i>LINCOME</i>	0.017	(0.095)	0.118**	(0.059)	-0.511***	(0.163)	-0.165	(0.142)	-0.247*	(0.147)	-0.466***	(0.159)	-0.152	(0.144)	0.197	(0.179)
<i>LPOP</i>	-0.008	(0.014)	0.010	(0.008)	-0.004	(0.024)	-0.035	(0.021)	-0.041*	(0.022)	-0.005	(0.024)	-0.031	(0.021)	0.047*	(0.027)
<i>YOUNG</i>	0.017**	(0.008)	0.001	(0.004)	-0.005	(0.010)	0.020*	(0.012)	0.011	(0.011)	-0.008	(0.010)	0.019	(0.012)	-0.019	(0.012)
<i>OLD</i>	-0.004	(0.004)	0.001	(0.002)	-0.003	(0.006)	-0.013**	(0.006)	-0.011**	(0.006)	-0.004	(0.006)	-0.013**	(0.006)	-0.007	(0.007)
<i>NONWHITE</i>	0.001	(0.001)	0.000	(0.001)	-0.004*	(0.002)	-0.001	(0.002)	-0.002	(0.002)	-0.003	(0.002)	-0.001	(0.002)	0.000	(0.002)
<i>HHSIZE</i>	-0.540***	(0.184)	-0.114	(0.103)	0.193	(0.256)	-0.760***	(0.279)	-0.268	(0.270)	0.270	(0.258)	-0.710**	(0.282)	0.142	(0.316)
<i>RENTER</i>	-0.002	(0.002)	-0.002	(0.001)	0.002	(0.004)	0.000	(0.004)	0.005	(0.004)	0.000	(0.004)	-0.002	(0.004)	0.000	(0.004)
<i>TIME WARNER</i>	0.130***	(0.027)	0.031	(0.032)	0.284***	(0.068)	-0.182**	(0.072)	-0.242***	(0.072)	0.068	(0.068)	-0.364***	(0.061)	0.376***	(0.044)
<i>N</i>	680		680		680		680		561		680		680		509	
Pseudo R^2	0.3293		0.1939		0.2271		0.1635		0.1217		0.1983		0.1661		0.1217	

Notes: Positioning models are estimated with the observations for systems that actually carry the subject networks and provide digital services. Marginal effects reported with standard errors in brackets. * indicates significance at 10% level, ** at 5% level, and *** at 1% level.

Table 10 Carriage of Premium Networks

	Showtime Carriage		TMC Carriage		STARZ! Carriage		Encore Carriage		Flix Carriage		Sundance Channel Carriage	
	(1)		(2)		(3)		(4)		(5)		(6)	
<i>RANK</i>	0.000	(0.000)	0.000	(0.000)	0.001	(0.001)	0.000	(0.001)	-0.001*	(0.001)	0.001	(0.001)
<i>LSIZE</i>	-0.002	(0.002)	0.000	(0.004)	0.023***	(0.007)	0.025***	(0.007)	0.023*	(0.012)	0.053***	(0.013)
<i>LAGE</i>	0.020*	(0.011)	0.002	(0.023)	-0.031	(0.045)	0.008	(0.041)	-0.041	(0.069)	-0.149**	(0.076)
<i>LHPASS</i>	0.007	(0.005)	0.037***	(0.012)	0.016	(0.024)	-0.021	(0.021)	-0.005	(0.037)	0.063	(0.041)
<i>LMILES</i>	0.002	(0.005)	-0.012	(0.010)	-0.019	(0.022)	0.011	(0.019)	0.051	(0.036)	0.026	(0.040)
<i>LCAPACITY</i>	0.011	(0.009)	0.019	(0.019)	0.061	(0.041)	0.068*	(0.041)	0.142**	(0.069)	0.243***	(0.075)
<i>DIGITAL</i>	0.176***	(0.057)	0.334***	(0.064)	0.687***	(0.056)	0.582***	(0.059)	0.368***	(0.048)	0.494***	(0.033)
<i>LINCOME</i>	-0.023	(0.021)	0.006	(0.041)	-0.129	(0.090)	-0.066	(0.088)	0.308**	(0.152)	0.384**	(0.164)
<i>LPOP</i>	-0.001	(0.003)	-0.006	(0.006)	0.030**	(0.013)	0.020	(0.013)	-0.028	(0.023)	-0.018	(0.025)
<i>YOUNG</i>	0.000	(0.002)	0.003	(0.003)	-0.003	(0.006)	-0.001	(0.006)	-0.005	(0.009)	-0.002	(0.008)
<i>OLD</i>	0.000	(0.001)	0.005**	(0.002)	-0.005	(0.004)	-0.002	(0.004)	0.012**	(0.006)	0.009	(0.006)
<i>NONWHITE</i>	0.000	(0.000)	-0.001	(0.001)	-0.003**	(0.001)	-0.002*	(0.001)	0.007***	(0.002)	0.008***	(0.002)
<i>HHSIZE</i>	-0.003	(0.037)	-0.017	(0.083)	0.043	(0.142)	-0.037	(0.148)	0.113	(0.237)	0.148	(0.241)
<i>RENTER</i>	0.001	(0.001)	0.004***	(0.001)	0.001	(0.002)	0.001	(0.002)	-0.003	(0.004)	-0.004	(0.004)
<i>TIME</i>												
<i>WARNER</i>	-0.027	0.034	-0.014	(0.041)	-0.076	(0.073)	-0.155**	(0.075)	-0.144**	(0.062)	-0.182***	(0.056)
<i>N</i>	680		680		680		680		680		680	
<i>Pseudo R²</i>	0.4270		0.4598		0.5330		0.4221		0.1687		0.3204	

Notes: Marginal effects reported with standard errors in brackets. * indicates significance at 10% level, ** at 5% level, and *** at 1% level.

Table 11 Positioning of Premium Networks in Analog Tier

	HBO in analog tier		Cinemax in analog tier		Showtime in analog tier		TMC in analog tier		STARZ! in analog tier		Encore in analog tier		Flix in analog tier		Sundance Channel in analog tier	
	(1)		(2)		(3)		(4)		(5)		(6)		(7)		(8)	
<i>RANK</i>	0.001	(0.001)	0.000	(0.001)	0.000	(0.001)	-0.002**	(0.001)	0.001*	(0.001)	0.001*	(0.001)	0.000	(0.000)	0.000	(0.000)
<i>LSIZE</i>	-0.008	(0.013)	0.007	(0.013)	-0.007	(0.013)	-0.020	(0.012)	0.028**	(0.012)	0.020*	(0.012)	-0.009	(0.005)	-0.008*	(0.004)
<i>LAGE</i>	0.012	(0.067)	0.026	(0.070)	0.032	(0.069)	0.040	(0.066)	-0.003	(0.056)	0.043	(0.059)	0.022	(0.032)	-0.013	(0.013)
<i>LHPASS</i>	0.013	(0.038)	0.047	(0.040)	0.034	(0.040)	0.034	(0.037)	0.059*	(0.033)	0.084**	(0.036)	-0.023	(0.018)	0.013	(0.009)
<i>LMILES</i>	-0.010	(0.038)	-0.035	(0.040)	-0.043	(0.040)	-0.062*	(0.037)	-0.037	(0.033)	-0.079**	(0.036)	0.017	(0.018)	-0.014	(0.009)
<i>LCAPACITY</i>	-0.016	(0.072)	0.050	(0.075)	0.151**	(0.075)	0.153**	(0.070)	0.189***	(0.064)	0.119*	(0.064)	0.031	(0.036)	-0.009	(0.021)
<i>LINCOME</i>	0.022	(0.161)	0.144	(0.169)	0.162	(0.170)	0.216	(0.159)	-0.049	(0.143)	-0.202	(0.146)	0.018	(0.062)	-0.079	(0.051)
<i>LPOP</i>	0.055**	(0.024)	0.055**	(0.026)	0.043*	(0.026)	0.023	(0.024)	0.000	(0.023)	-0.001	(0.023)	0.000	(0.010)	0.001	(0.007)
<i>YOUNG</i>	0.001	(0.009)	0.007	(0.010)	-0.004	(0.009)	-0.001	(0.008)	0.007	(0.007)	0.007	(0.007)	-0.012**	(0.005)	-0.007*	(0.004)
<i>OLD</i>	0.003	(0.006)	0.009	(0.006)	0.003	(0.006)	0.007	(0.006)	0.004	(0.005)	-0.003	(0.005)	-0.003	(0.002)	-0.003*	(0.002)
<i>NONWHITE</i>	-0.002	(0.002)	-0.004*	(0.002)	0.001	(0.002)	0.000	(0.002)	-0.003	(0.002)	-0.005***	(0.002)	0.002**	(0.001)	0.000	(0.001)
<i>HHSIZE</i>	-0.346	(0.245)	-0.375	(0.264)	-0.344	(0.246)	-0.154	(0.245)	0.055	(0.203)	-0.107	(0.213)	0.212*	(0.124)	0.103	(0.088)
<i>RENTER</i>	0.003	(0.004)	0.005	(0.004)	0.001	(0.004)	0.000	(0.004)	0.007**	(0.003)	0.009**	(0.004)	-0.002	(0.002)	-0.001	(0.001)
<i>TIME</i>																
<i>WARNER</i>	-0.114*	(0.069)	-0.083	(0.069)	-0.037	(0.069)	-0.124**	(0.056)	-0.139***	(0.041)	-0.200***	(0.037)	0.073	(0.070)	0.002	(0.025)
<i>N</i>	561		561		554		544		535		529		301		312	
Pseudo R^2	0.0363		0.0577		0.0550		0.0660		0.0729		0.0735		0.1517		0.2602	

Notes: Positioning models are estimated with the observations for systems that actually carry the subject networks and provide digital services. Marginal effects reported with standard errors in brackets. * indicates significance at 10% level, ** at 5% level, and *** at 1% level.

Table 12 Positioning of Premium Networks in Basic vs. Premium tiers

	Encore in basic tier		Flix in basic tier		Sundance Channel In basic tier	
<i>RANK</i>	0.001	(0.001)	0.000	(0.001)	0.001	(0.001)
<i>LSIZE</i>	0.065***	(0.012)	0.050***	(0.013)	0.181***	(0.025)
<i>LAGE</i>	-0.051	(0.062)	-0.084*	(0.044)	0.088	(0.088)
<i>LHPASS</i>	-0.095***	(0.035)	-0.021	(0.027)	0.024	(0.052)
<i>LMILES</i>	0.081**	(0.035)	0.042	(0.028)	0.014	(0.050)
<i>LCAPACITY</i>	0.193***	(0.064)	0.093	(0.063)	-0.209*	(0.118)
<i>DIGITAL</i>	0.160***	(0.061)	-0.330	(0.243)	-	-
<i>LINCOME</i>	0.389***	(0.149)	0.020	(0.120)	0.432*	(0.246)
<i>LPOP</i>	-0.015	(0.024)	0.041**	(0.021)	-0.009	(0.039)
<i>YOUNG</i>	-0.005	(0.008)	-0.026**	(0.010)	-0.026	(0.020)
<i>OLD</i>	0.005	(0.005)	-0.008*	(0.004)	-0.001	(0.010)
<i>NONWHITE</i>	0.004**	(0.002)	0.003*	(0.002)	0.002	(0.003)
<i>HHSIZE</i>	-0.250	(0.240)	0.315	(0.227)	0.742	(0.486)
<i>RENTER</i>	0.002	(0.004)	-0.013***	(0.003)	0.006	(0.006)
<i>TIME WARNER</i>	0.186***	(0.070)	0.011	(0.048)	-0.422***	(0.092)
<i>N</i>	565		314		312	
Pseudo R^2	0.1577		0.3821		0.3574	

Notes: Positioning models are estimated with the observations for systems that actually carry the subject networks. Marginal effects reported with standard errors in brackets. * indicates significance at 10% level, ** at 5% level, and *** at 1% level.

When estimating the Sundance Channel model, the DIGITAL variable was dropped because no system without digital service carries Sundance Channel in the basic program tier.

References

- Chipty, T. (2001). "Vertical Integration, Market Foreclosure, and Consumer Welfare in the Cable Television Industry." *American Economic Review* 91(3): 428-453.
- Federal Communication Commission (1994). Annual Assessment of the Status of Competition in the Market for the Delivery of Video Programming.
- _____ (2004). Annual Assessment of the Status of Competition in the Market for the Delivery of Video Programming.
- Ford, G. S. and J. D. Jackson (1997). "Horizontal Concentration and Vertical Integration in the Cable Television Industry." *Review of Industrial Organization* 12(4): 501-518.
- Goolsbee, A. and Petrin, A. (2004). "The Consumer Gains from Direct Broadcast Satellites and the Competition with Cable TV." *Econometrica* 72(2): 351-381.
- Owen, B. M. and S. S. Wildman (1992). *Video Economics*. Cambridge, Massachusetts: Harvard University Press.
- Salinger, M. A. (1988). "Vertical Mergers and Market Foreclosure." *Quarterly Journal of Economics* 103(2): 345-356.
- Waterman, D. and A. A. Weiss (1996). "The Effects of Vertical Integration between Cable Television Systems and Pay Cable Networks." *Journal of Econometrics* 72(1-2): 357-395.
- Waterman, D. and A. A. Weiss (1997). *Vertical Integration in Cable Television*. Cambridge, Massachusetts: The MIT Press.
- Waterman, D. and M. Z. Yan, (1999) "Cable Advertising and the Future of Basic Cable Networking," *Journal of Broadcasting & Electronic Media*, Vo. 43, No. 4, Fall.